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SAFETY IN THEATERS.

THE liberalizing tendencies of modern thought, combined with the increasing demands for mental relaxation necessitated by the sustained and determined intensity of our business life, have augmented the patronage of the theater to an extent that almost surpasses our surprising development in other directions.

If we look back two generations we find only three or four buildings devoted to amusement in New York city, with an average attendance per night that could hardly have exceeded fifteen hundred persons. During the last season in that city some fifty different entertainments have been patronized by a nightly attendance of from twenty-five to thirty thousand people. Throughout the whole United States, it is safe to say that five hundred amusement attractions are usually presented to the public every day of the season, with an average patronage of about four hundred persons each. This calculation gives us an amusement-going public of two hundred thousand individuals a day. As the theatrical season generally covers three hundred performances to each house, the average annual attendance at the various halls and theaters throughout the country probably ranges to from fifty to sixty millions.

Considering the enormous number of lives continually submitting themselves to the perils of the play-house, the question of safety in theaters becomes one of national importance, and should engage the attention of legislators far more than it has done heretofore.

This question presents three sides:

First. Risks from faulty construction of walls and floors, protection from which should be insured by the integrity of our building departments.

Second. Risks from fire, for security from which we must look to our fire departments.

Third. Risks from foul air, freedom from which ought to be guaranteed by the vigilance of our health departments.

The shocking accident which occurred at the Madison Square Garden, in New York, some two years ago—when a portion of the roof and walls fell in upon the festivities of the Homeopathic Fair—served as a fearful warning to the building department of that city, and startled it into so full a consciousness of its responsibilities, and into such a conscientious discharge of its duties, that the danger from falling walls, or floors, is now exceedingly slight—so slight, indeed, that it is hardly worth while to devote any of the space at our command to the discussion of this side of our subject.

Fire is the disaster most dreaded by the public at the theater, and yet the insidious effects of poisonous air arising from bad ventilation, though less apparent, are more fatal, perhaps, than those of fire, for they often sow the seeds of incurable disease, and prove the final cause of more misery than all the fires that have ever overtaken audiences while listening to plays.

The measures whereby the public is to be absolutely secured from the danger of fire or foul air at the theater have never received the earnest attention they deserve from either our fire or health departments. Such terrible catastrophes as the burning of the Brooklyn Theater, and the Opera Houses at Nice and Vienna, sufficed for a time to direct the attention of fire departments to the faulty interior arrangements of theaters, but the earnestness of this attention has been so transitory, and the investigations that have followed have been so superficial, that it is very doubtful if there exists to-day a single place of amusement in the United States devoid of danger from fire, or one where safety, if fire occurred, would not prove due to good luck far more than to any proper preparation on the part of the management, for the accidents that fire is too liable to cause. As far as sanitary safety in houses of amusement is concerned, there is no instance on record of its consideration by any of the boards of health in this country, although it requires but little common sense to perceive the serious importance of this matter to patrons of the play-house.

The theater can and should be made entirely free from danger to human life, and a few suggestions as to the practical means of attaining this end will prove timely, if they serve to excite any more earnest interest in this subject among those who make the laws, and who alone can secure to the public the safety to which it is entitled.

The burning of the Brooklyn theater—as a revelation of the dangers prevalent in our own community—is the disaster from which we have most to learn. The fire illustrated with appalling power the horrible possibilities that may overtake a crowd in buildings devoted to amusement. As it is the most conspicuous example we have ever had of the defects in construction and in management which render the theater dangerous, a brief study of its attendant circumstances cannot fail to be instructive. The Brooklyn fire, within a few minutes, converted over three hundred gay and joyous men and women into charred and horrible corpses, whose identity was obliterated by its relentless fury. It started among the borders that hang above the painted flats upon the stage, and spread with frightful rapidity among the dry and inflammable draperies in the rigging loft. The burning scenery soon fell in great masses upon the boards below, and the flames, having no outlet behind the curtain, burst through the proscenium arch, pouring vast volumes of smoke into the auditorium, where the audience, imprisoned by the pack in the aisles, and by the obstructing barricades formed by the seats, were suffocated before they could reach the doors, where air might have been obtained.

It is a fact worthy of special emphasis, that the immediate cause of death in disasters of this kind is asphyxiation, the flames not reaching the victims until a comparatively long time after they have fallen fainting and lifeless from the inhalation of smoke.

The primary danger at the Brooklyn Theater lay in the inflammable nature of the scenic department, behind the proscenium wall, but this danger was enormously reënforced by the character and arrangement of the seats, and the insufficient number of aisles allowed for the exit of the audience. In all these respects, however, the Brooklyn Theater was superior to most of those crowded by the public, during the regular season, throughout the United States.

Whenever a place of amusement is burned during the progress of a performance, the fact is most powerfully proved that there are two points especially dangerous in the present construction of theaters:

First. In the scenic department, behind the curtain, which is the most inflammable portion of the house.

Second. In the nature and arrangement of the seats, which impede the passage of the audience to the doors.

The Brooklyn fire had the effect, for a time, of almost emptying every place of amusement. For a few weeks it aroused serious attention to the question of safety in theaters. To Mr. Wallack is due the honor of being the first, and, as far as is known, the only manager who gave his attention to any practical investigation of this momentous question. Immediately after the Brooklyn tragedy, the writer of this paper assisted Mr. Boucicault in making certain experiments in the fire-proofing of scenery at Mr. Wallack's theater. The result of those experiments was so satisfactory that it was believed a method had been discovered of rendering fire impossible in the scenic department of the house. Tungstate of soda was found to be the best substance for this purpose, and Mr. Wallack's scenery was at once repainted with a solution of this material. Unfortunately, however, it soon became evident that, whereas scenery thus treated could not be burned, neither could it long remain scenery. Night after night the stage was covered with a fine dust very distressing to the lungs of the artists, and destructive to the furniture in the scenes. In a little over a week the paint had fallen almost entirely from the flats, the canvas of which had become ruined by dry rot. Experiments were continued, with the hope of overcoming the defects existing in the different solutions that had been tested; but, after many failures, the fire-proofing of the scenery was abandoned in disgust, and, the terror of the moment having passed away with the public, everything slipped quietly back into the old grooves, and theaters once more became as unsafe as though the ghastly horror in Brooklyn had never occurred.

The rigging-loft is filled with draperies called scenic borders. Among these hang long lines of gas-pipes, provided with many burners, constituting border lights. A net-work of wire covers these lights to prevent the borders from coming in contact with the gas-jets. To a large extent this net-work serves its purpose, but the heat generated by the lights is so intense that the rigging in the loft becomes dangerously dry and inflammable; and as the men on the fly-floors are obliged to work the rigging in great haste, in setting scenes between acts, a very little carelessness on their part is sufficient to start a fire.

No way has yet been found to fire-proof scenery without ruining it. Every hour, therefore, that the stage is lighted the risk of fire exists. The important points to decide are:

First. How best to limit the area of any fire that may occur.

Second. What construction of the stage department renders it least dangerous, in case of fire, to those in the auditorium.

Third. What constitutes the most nearly perfect preparation for the speediest extinction of any fire that may once begin.

The scenic department must, from necessity, remain the most dangerous part of the house, and the only way of confining any fire that may occur there, is to environ it with some material that will neither burn nor transmit heat. Tin and zinc are occasionally used to incase the wood-work about the stage and rigging-loft; but, as they both transmit heat, the protection of the wood-work would be more complete if thin layers of clay, or plaster-of-Paris, were placed between the metal and the wood. A mixture of papier-maché with clay and powdered asbestos, rolled into sheets from a quarter to half an inch in thickness and nailed to the whole of the stationary wood-work of the scenic department, would enable it to resist the fiercest fire likely to be produced by the burning of the scenery. The advantages of this preparation are its non-conductiveness of heat and its non-expansiveness. The great trouble with metal for fire-proofing purposes lies in its tendency to expand and tear away from the spot it is intended to protect, and also in its liability to melt, or to transmit heat to such an extent as to ignite the wood it incases. The papier-maché mixture neither melts, expands, nor transmits heat. If the entire scenic department were thus lined, the scenery might burn with impunity without imperiling its surroundings.

The second point, viz., the proper relation of the scenic department to the auditorium, is the one whose right solution most concerns the safety of the public.

Suffocation is the calamity most to be feared from fire in a theater. Make this impossible, and the worst results of panic will be avoided. A thick wall of brick usually does, and always should, separate the auditorium from the rigging-loft. If the proscenium arch, or stage opening, in this wall, is not larger than is absolutely necessary for the exhibition of the scenery, when the curtain is raised, then the whole space behind the proscenium wall can be converted into an immense chimney, through which all flame and smoke from a fire can easily escape. This is to be accomplished by building into the roof, over the rigging-loft, a series of trap-doors, so weighted and fastened that they will fall open of themselves the moment their fastenings are released. If a curtain of zinc, or of the material already suggested for protecting the wood-work, be added to the above arrangement of the roof, then the means of securing an audience from asphyxiation in case of fire would be complete. The action of the roof-traps and the salamander curtain can be rendered entirely automatic by attaching their fastenings to iron pins, placed in the rigging-loft, and set in solder so softened with bismuth that it will be sure to melt in a temperature of one hundred and sixty degrees. Any fire behind the scenes, large enough to be dangerous, would very quickly melt the solder that held the pins, free the traps and curtain, which of their own weight would fall, and thus automatically open the roof and close the proscenium arch.

The audience having been secured from all danger of suffocation, the next point to be considered is: What constitutes the most nearly perfect measures for the speedy extinction of any fire that may once begin.

There are two resources for meeting this emergency, one of which consists in having at hand, and in working order, the best known means for extinguishing fire; the other implies the organization and training of employés for the wisest use of these means. Immediate command of water, at any point in the theater where fire can possibly occur, is the first thing essential for its extinction; to obtain this it is necessary to provide water pipes and hose in all portions of the house in the least degree inflammable. But this will be of no avail unless the pressure of the water in these pipes is sufficient to throw large streams from the hose to the points it is intended to reach. As the public reservoirs rarely supply this pressure, the surest way to secure it is to construct in some part of the theater a large air-tight tank, capable of holding from sixty to eighty thousand gallons of water. A small air-condensing pump should be attached to this tank, by the use of which the hand of one man can easily bring to bear upon the water in the tank a pressure of seventy pounds to the square inch, which is enough to throw a volume of water from forty to sixty feet, depending upon the size of the nozzle of the hose. If the tank is made thoroughly air-tight the test of the pressure by the pump once a month will be enough to keep it constantly at the force desired. From the tank a large main duct should pass as near to the prompter's box as possible; at this point, a valve commanding the flow of the water should be placed in the pipe. This valve should be kept constantly open, so that the water would always be in readiness at the hose; but when, in case of fire, the water had done it work, the valve would enable the prompter—who should never desert his post while a performance is in progress—to instantly shut off the supply, and thus prevent the water from doing unnecessary damage to the property the fire had not injured. This valve is especially needful in case the theater is supplied with any of the automatic sprinklers which have lately been invented, and which it would be well for the law to force all managers to adopt. These sprinklers have been in use in many of our cotton-mills for several years, and their efficacy has been repeatedly demonstrated. A net-work of water pipes connected with the air-tight tank should be placed over the rigging loft. These pipes should be provided with the sprinklers, which are sealed with solder fusible at a temperature of one hundred and sixty degrees. If this arrangement were combined with the automatic roof-traps and curtain, the heat of any dangerous fire would immediately open the roof, close the proscenium arch, and start the water upon the flames.

The largest fire always has but a small beginning. Vigilance, an ax, and a good chemical fire extinguisher, are often all that is required to put out a fire, and prevent great loss of property. If we add these to the air-tight tank, hose, and automatic sprinklers, the equipment for fighting fire will be as nearly perfect as modern invention at present permits. And yet, with all these things provided, safety is far from assured, unless trained hands and cool heads stand ready to make speedy and intelligent use of them. The stage-carpenters, machinists, property-men, gas-men, ushers, etc., should be organized into a regular fire company. Some of these men should be detailed to the striking of the scenery, some to the use of the axes, some to the hose, and others to the extinguishers. To each man should be assigned his special post, and this organization being completed, the men should be drilled once a week by an experienced fireman, who ought to be detailed to the theater by the fire department of the city, and remain behind the scenes during every performance, ready to command and direct the action of the men, should fire occur.

With every precaution for preventing, and every means at hand for extinguishing it, fire may break out and spread with disastrous consequences. The danger of this, however, would be very much diminished by the adoption of the idea presented above, which would give to the establishment a well-drilled fire company without causing any additional expense to its manager. It is exceedingly difficult to prevent the possibility of fire, but good management may so well prepare for it that its occurrence need cause no alarm to an audience. In the smaller cities and towns of the country, where paid fire departments do not exist, and where managers cannot afford to keep a corps of employés on hand, the automatic roof, curtain, and sprinklers would have to be intrusted with the office of securing the audience from suffocation, and the proprietor from any great destruction of property.

We now come to the consideration of the dangerous imperfections in the arrangement of the auditorium.

Seven persons of average size can pass abreast through an opening ten feet wide. When a crowd are hurrying from a house, it is probable that two rows of seven persons each will escape through a passage of this size in each second. In thirty seconds, then, four hundred and twenty people would pass through ten feet of exit-room, and as the largest theater in this country does not permit of the seating of more than one thousand persons upon any one floor, it would appear that thirty feet of passage-width to each floor would be more than enough to empty our largest house in half a minute. In consequence of the confusion, and the obstructions occasioned by a panic, however, it would be safer to double the proportion of room in the above calculation and allow ten feet of doorway to every two hundred seats. There are very few theaters that would be found lacking in this respect, while there is not one, at present, in which the arrangement of the seats themselves is not a source of danger,—for the real difficulty in emptying a theater is not caused so much by the limitation of space allowed for the exits as by the fact that the passage to the doors is blocked by the seats themselves, and by the wedging of the crowd, in their haste to escape through the aisles. To obviate this difficulty seats should be placed in the auditorium capable of converting the floors into a series of aisles in every direction, whenever the audience desires to leave the house. Seats of this kind would remove the most perilous point in the play-house; for in the rush of a crowd many are crushed to death, or rendered insensible by being pressed against the present immovable rows of chairs or benches.

Regarding the pernicious effects of bad ventilation, we can realize their danger more completely, perhaps, when we reflect that to none is the entertainment of the play-house so grateful, or so beneficial, as to those whose vitality has been impaired by the tyrannous pressure of business affairs, and yet to none is the theater — as generally constructed — so dangerous. This is owing to the fact that, in almost every place of amusement there is a lack of ventilation, which is extremely deleterious even to those in full health, and exceedingly dangerous to those whose depressed vitality renders them the easy victims of the blood-corrupting air which accumulates from a crowd confined within walls.

If the condition of our streets and the regulation of the plumbing in private houses are proper matters of regulation by our boards of health, then, emphatically, the ventilation of the halls and theaters, wherein the lives of millions are annually exposed to insidious poisoning from foul air, is a fit subject for investigation and governmental control. In short, if legislation would bestow upon our fire and health departments the same power to secure safety to the public in their respective spheres of control that it has already given to our building departments, then the theater could be made absolutely free from every species of risk to life. To realize this security to the public, laws should be enacted, and enforced, obliging all proprietors of buildings constructed for the accommodation of a crowd to conform to the following rules:

First. To veneer all the wood-work in the scenic department with some fire-proof composition sure to protect it from any fire that may occur in that inflammable portion of the house.

Second. To construct in the roof above the rigging-loft large trap-doors, so weighted that they will fall open of themselves the moment they are unfastened. Their fastenings either to be automatic, or easily controlled from the prompter's box.

Third. To hang an automatic fire-proof curtain in the proscenium arch.

Fourth. To provide an air-tight tank with air-condensing pump attachment, capable of holding water enough to extinguish any ordinary fire likely to start during a performance, which shall be connected with a plentiful supply of pipes, furnished with automatic sprinklers and hose, on every working, or fly-floor.

Fifth. To keep in working order two fire-extinguishers for every working or fly-floor.

Sixth. To supply two axes to every working or fly-floor.

Seventh. To organize all the employés of the house into a fire company to be drilled at least once a week by a competent fireman detailed to this duty by the fire department of the city.

Eighth. To adopt a seat that is capable of converting each floor in the auditorium into a series of aisles at any time.

Ninth. To provide the best known system of ventilation for the auditorium.

Tenth. To allow ten feet of exit room to every two hundred seats on a floor.

These should be the ten commandments of government to amusement managers, the breaking of which should entail a speedier retribution than usually follows the violation of those of Moses.

STEELE MACKAYE.